VIBRAC

DTR4600 AND MODEL 2600
READOUT/CONTROL INSTRUMENTS

SERIAL NO: _____

DATE: _____

DTR4600 AND MODEL 2600
READOUT/CONTROL INSTRUMENTS

VIBRAC CORPORATION
16 COLUMBIA DRIVE
P.O. BOX 840
AMHERST, NH 03031

6/82

TITLE	DTR4600 AND MODEL 2600 READOUT/CONTROL INSTRUMENT	DWN: JRL
		DATE: 6/4/82

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Vibrac® CORPORATION
Amherst, N.H. U.S.A. 603-882-6777

DRAWING #MNL2600/4600	REV
SHEET 1 OF 1 SHEETS	

1.0 DESCRIPTION

1.1 Introduction

The Vibrac Model DTR4600 and 2600 instrument and associated spindle test heads offer a rapid, accurate means of evaluating or torque testing rotating (prime mover) devices. The test heads, configured in dynomometer form, have been designed with carefully selected spindle components that maintain the lowest inertia and frictional load levels allowing for accurate torque measurements free of cogging and inertia errors. The DTR4600 and 2600 instruments have been designed to provide an accurate test head readout system and provides for convenient display and load controls.

1.2 DTR4600 Front Panel Description (See Fig. 1-1)

1.2.1 Power

Instrument power switch, push in for on and off. The lamp indicates that the switch is engaged.

1.2.2 Torque Readout

The 4½ digit meter is scaled to read dynamic torque test results in direct engineering units or in percent of full-scale

1.2.3 Zero Adjust

The 10 turn potentiometer is for setting the proper zeroing lamp voltage of the dynamic spindle torque transducer

1.2.4 Torque Transducer Select

The thumbwheel switch is for scaling the torque readout to the torque transducer to be displayed (See Table 1-1)

1.2.5 Torque Units Select

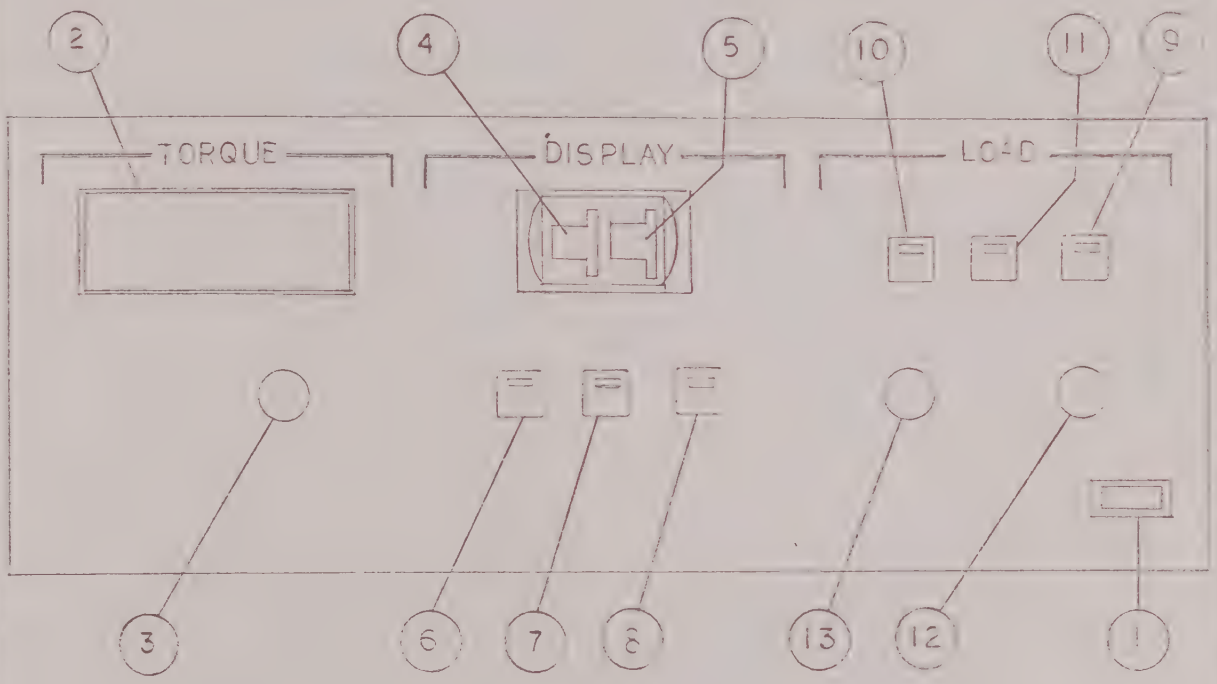
The thumbwheel switch is for selecting the desired engineering units to be displayed (See Table 1-1)

1.2.6 Peak Torque

The lighted push-button switch, when engaged, will display peak torque from internal circuits on the torque readout (which is useful for dynamic pull-out torque measurements). The switch

is electrically interlocked with the display hold and reset switches. The lamp indicates that the switch is engaged.

FIGURE 1-1 FRONT PANEL, DTR4600 INSTRUMENT



1.2.7 Display Hold

The lighted push-button switch, when engaged, will hold or lock the torque readout. The switch is electrically interlocked with the peak torque and reset switches. The lamp indicates that the switch is engaged.

1.2.8 Reset

The lighted push-button switch, when engaged, will dump the internal peak holding circuits and reset the peak torque and display hold switches. The lamp indicates that the switch is engaged.

1.2.9 Stall (Auto Load Control)

The lighted push-button switch, when engaged, will control the dynamic spindle load brake to ramp (at a rate determined by ramp adjust 1-2-12) from 0 torque to that torque required to pull out the MUT. The switch is electrically interlocked with the torque and load OFF switches. The lamp indicates that the switch is engaged.

1.2.10 Torque (Manual Load Control)

The lighted push-button switch, when engaged, will control the dynamic spindle load brake to manually set a torque load at a level determined by the torque adjust 1-2-13. The switch is electrically interlocked with the stall and load OFF switches. The lamp indicates that the switch is engaged.

1.2.11 Load OFF

The lighted push-button switch, when engaged, will remove power from the dynamic spindle load brake. The switch is electrically interlocked with the stall and torque switches. The lamp indicates that the switch is engaged.

1.2.12 Ramp Adjust

The potentiometer is for setting the desired load ramp rate as described in 1.2.9

1.2.13 Torque Adjust

The multi-turn potentiometer is for setting the desired manual torque load as described in 1.2.10

1.3 2600 Front Panel Description (See Figure 1-2)

1.3.1 Power

Instrument power switch, push in for on and off. The lamp indicates that the switch is engaged

1.3.2 Torque Readout

The 4½ digit meter is scaled to read dynamic torque test results in direct engineering units or in percent of full-scale

1.3.3 Zero Adjust

The 10 turn potentiometer is for setting the proper zeroing lamp voltage of the dynamic spindle torque transducer

1.3.4 Torque Transducer Select

The thumbwheel switch is for scaling the torque readout to the torque transducer to be displayed (See Table 1-1)

1.3.5 Torque Units Select

The thumbwheel switch is for selecting the desired engineering units to be displayed (See Table 1-1)

1.3.6 Peak Torque

The lighted push-button switch, when engaged, will display peak torque from internal circuits on the torque readout (which is useful for dynamic pull-out torque measurements). The switch is electrically interlocked with the display hold and reset switches. The lamp indicates that the switch is engaged.

1.3.7 Display Hold

The lighted push-button switch, when engaged, will hold or lock the torque readout 1.3.2 and the speed readout meters. The switch is electrically interlocked with the peak torque and reset switches. The lamp indicates that the switch is engaged.

1.3.8 Reset

The lighted push-button switch, when engaged, will dump the internal peak holding circuits and reset the peak torque and display hold switches. The lamp indicates that the switch is engaged.

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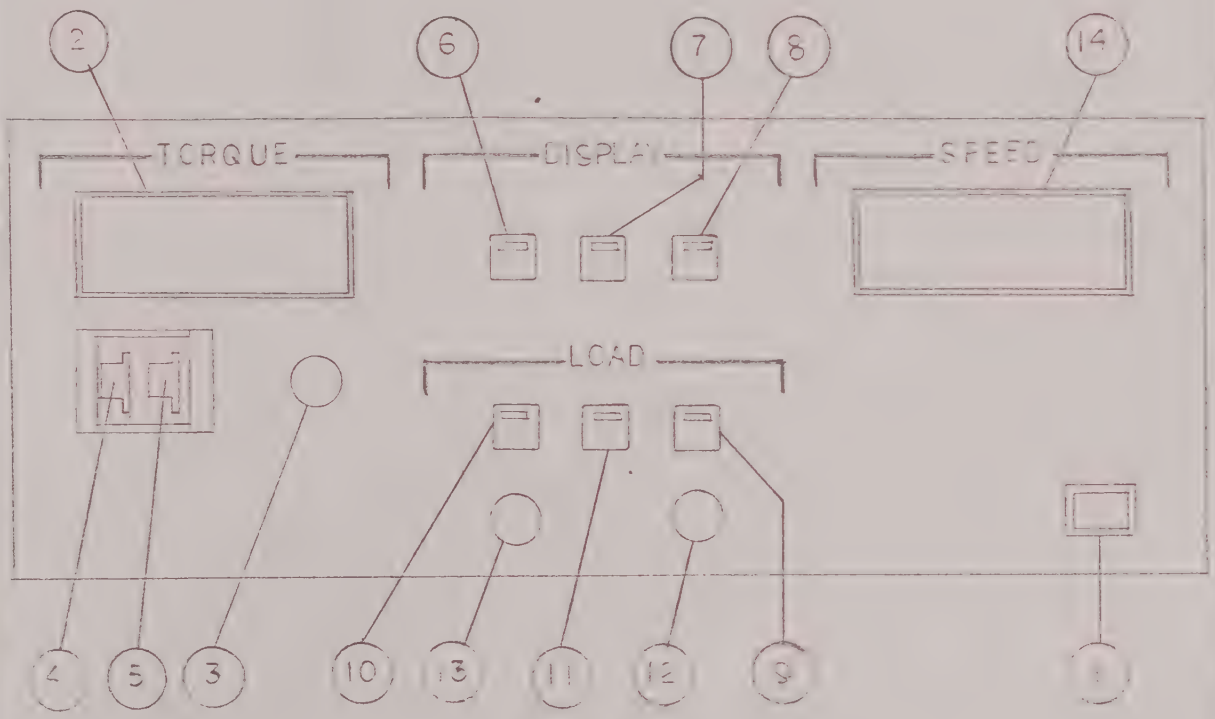
FIGURE 1-2 FRONT PANEL, MDL. 2600 INSTRUMENT



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1.3.9 Stall (Auto Load Control)

The lighted push-button switch, when engaged, will control the dynamic spindle load brake to ramp (at a rate determined by ramp adjust) from 0 torque to that torque required to pull out the MUT. The switch is electrically interlocked with the torque and load off switches. The lamp indicates that the switch is engaged.

1.3.10 Torque (Manual Load Control)

The lighted push-button switch, when engaged, will control the dynamic spindle load brake to manually set a torque load at a level determined by the torque adjust. The switch is electrically interlocked with the stall and load off switches. The lamp indicates that the switch is engaged.

1.3.11 Load Off

The lighted push-button switch, when engaged, will remove power from the dynamic spindle load brake. The switch is electrically interlocked with the stall and torque switches. The lamp indicates that the switch is engaged.

1.3.12 Ramp Adjust

The potentiometer is for setting the desired load ramp rate as described in 1.3.9

1.3.13 Torque Adjust

The multi-turn potentiometer is for setting the desired manual torque load as described in 1.3.10

1.3.14 Speed Readout

The 4½ digit meter is scaled to read speed in RPM engineering units.

1.4 Models 2600 And DTR4600 Rear Panel Description (See Figure 1-3)

1.4.1 Power Receptacle

115 VAC, 60 HZ Input

1.4.2 Power Fuse

System power fuse (2 amp Slo-Blo fuse)

1.4.3 Load Supply Fuse

Loading device power supply fuse (1½ amp Slo-Blo fuse)

1.4.4 Torque Output

Analog torque output connector (mating connector-UG88/M or equivalent)

1.4.5 Speed Output (2600 Instrument Only)

Analog speed output connector (mating connector UG88/M or equivalent

1.4.6 Transducer Input

Transducer input connector, connections supplied

1.4.7 BCD Output

BCD output connector (optional) (See Table 1-2)

FIGURE 1-3 REAR PANEL, DTR4600 AND MODEL 2600

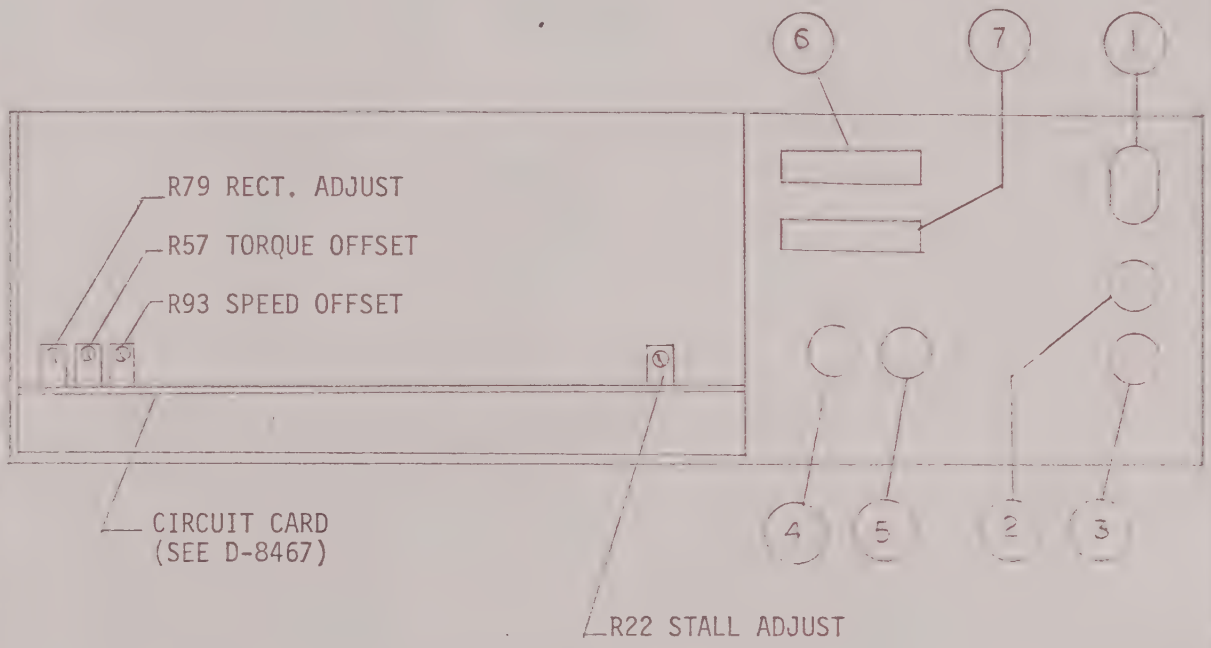


TABLE 1-1

SPINDLE SELECTOR IN FULL SCALE READOUT

SPINDLE SELECTOR	OZ-IN UNITS	LB-IN UNITS	N CM. UNITS	TORQUE TRANSDUCER
T-1	3.200	0.2000	2.260	TQ-3.2
T-2	10.000	0.6250	7.061	TQ-10
T-3	32.00	2.000	22.60	TQ-32
T-4	50/100.00	3.125/6.250	35.31/70.62	TQ-100/50
T-5	160.00	10.000	113.00	TQ-160
T-6	400.0	25.00	282.5	TQ-400
T-7	512.0	32.00	361.5	TQ-512
T-8	800.0	50.00	565.0	TQ-800
T-9	1600.0	100.00	1130.0	TQ-1600
T-10	5120.	320.0	3615.	TQ-5120

%FS Selection reads 100.00 full-scale for all transducers which is useful for torque transducer calibration.

NOTE: Analog output for torque
0 to ±10 volts = 0 to ±full scale torque for each transducer listed above.

TABLE 1-2

BCD OUTPUT RUN LIST

01	BCD 1
02	BCD 2
03	BCD 4
04	BCD 8
05	BCD 10
06	BCD 20
07	BCD 40
08	BCD 80
09	BCD 100
10	BCD 200
11	BCD 400
12	BCD 800
13	BCD 1000
14	BCD 2000
15	BCD 4000
16	BCD 8000
17	BCD 10000
18	+ Polarity
19	Print Command
20	Ground
21	- 25 N.C.

2.0 INSTALLATION AND OPERATION

2.1 General

Retain all packaging materials in the event that the instrument (s) must be returned to the factory.

2.2 Receiving Inspection

After opening the package, the instrument(s) should be carefully inspected for damage. Any damage should be promptly reported to the shipping agent and to Vibrac.

2.3 Installation

All instruments manufactured at Vibrac are 115VAC, 60 HZ operation.

2.3.1 Input Connections

The transducer input connector (rear Panel) is intended for use with Vibrac optical torque transducers only.

Connect the power cable provided from the instrument rear panel AC receptacle to a convenient 115VAC, 60 HZ power source. Connect the torque transducer and speed transducer (where applicable) with transducer cable provided and connect to the instrument transducer input. Connect the load power cable to the load output connector.

2.3.2 Output Connections

Analog torque and speed outputs (where applicable), are provided at the rear panel via BNC connectors. These outputs are intended for plotter and recorder use only.

2.3.3 Safety Precautions

As with all rotating testing devices, certain safety precaustions should be instituted. For example, precautions should be taken to assure that fingers, tools, and clothing are clear of the rotating members of the test spindles. Suitable local safety measures should be instituted to satisfy in-house regulations. Recommendations might include operator training, transparent safety housings or enclosures and or warning signs or labels.

2.4 Operating Instructions

2.4.1 General

Once the proper input power and the proper input connections are assured, press the instrument power switch to the "On" position. Press the "Off" switch in the "Load" section to assure that no power is applied to the load brake. Adjust the "Zero Adjust" for a zero torque indication on the digital torque meter (this adjustment must be made with no load applied to the torque transducer). Allow a 30 minute warm-up period before attempting any test. After the warm-up period, re-adjust the zero adjust potentiometer if required. With a suitable fixture and coupling, couple the DUT to the dynamometer spindle. The system is now ready for operation.

2.4.2 Manual Load Control

To select the manual mode, depress the "Torque" push-button switch and adjust the "Torque Adjust" potentiometer to the desired load level. Speed and torque levels will be displayed on their respective digital meters. To terminate the test, depress the "Off" push-button switch. This will remove power from the load brake.

2.4.3 Automatic Load Control

To utilize the automatic load application mode of operation, adjust the "Ramp Adjust" potentiometer to the desired ramp level then depress the "stall" push-button switch. The load will be ramped from no load to full load at the pre-set rate. To terminate the test, depress the "Off" push-button switch. This will remove power from the brake.

2.4.4 Peak

To select the peak mode, press the "Peak" switch in the "Load" section. If the device under test, during a specific test run, has passed through a distinguishable peak torque point, internal holding circuits will have stored this peak torque level. By pressing the "Peak" switch, the stored value is recalled and displayed on the torque digital readout. To reset and terminate the peak mode, press the "Reset" switch. NOTE: Press the "Reset" switch prior to every test run.

2.4.5 Hold Displays

To lock or hold both the digital torque and speed meters, press the "Hold Displays" push-button switch. Both the digital torque and speed meters will be locked to their last instantaneous readings.

3.0 SPECIFICATIONS

3.1 Introduction

This section provides rated capacities, overload capacities, components accuracies, and overall accuracies of each sub system and all torque transducers of this test stand.

3.2 Torque Transducers (See Data Sheet)

Type - Bearing mounted, torsion bar using optical method of torque measuring

Slip Rings and Brushes - None

Strain Gauges - None

Full-scale Torque - as indicated on name plate

Overall Accuracy - ±1.0% of span (includes ripple, linearity, hysteresis, and calibration)

Overload Capacity - ±100%

Calibration Method - Static weight and moment beam traceable to NBS

Output - ±100 microamperes = ±100% F.S.

3.3 Speed Transducers

Type - Low inertia DC tachometer

Linearity - .1% span

Overall Accuracy - ±0.5% of span

3.4 Dynamic Torque Spindles

3.4.1 Loading Device

Load Brake Type - Magnetic Particle Brake

Speed Range - See Table 3-1

Torque Capacity - See Table 3-1

Drag Torque - Less than 2 percent of span

Moment of Inertia - As indicated on spindle label

3.5 DTR4600 And Model 2600 Instrument

3.5.1 Torque Display

Display - 4½ digit readout

Accuracy - ±0.25% of span ± 1 digit

Selection Switch for Oz-in, N-CM, lb-in, and % F.S. units

3.5.2 Speed Display (2600 Only)

Display - 4½ digit readout

Accuracy - ±0.25% of span ± 1 digit

TABLE 3-1

DTR4600 SERIES - TORQUE SPINDLES

	MAX. TORQUE	MAX. SPEED (RPM)	NON-EXCITED TORQUE (FRICTION)	MAX. CONT. POWER (WATTS)	MDL. DTL4610	SHAFT DIAMETER
1	10 oz-in	3000	0.5 oz-in	25	10	.250
2	32 oz-in	3000	2 oz-in	50	32	.250
3	100 oz-in	2000	2 oz-in	100	100	.250
4	160 oz-in	2000	4 oz-in	100	160	.500
5	400 oz-in	2000	1 in-lb	150	400	.500
6	512 oz-in	2000	2 in-lb	150	512	.500
7	800 oz-in	2000	2 in-lb	150	800	.625
8	1600 oz-in	2000	2 in-lb	200	1600	.625

3.5.3 Dynamic Torque Load Control

Off - Turn off all power to load brake

Torque - Causes the load brake to be controlled by the torque adjust control

Stall - Causes the load brake to be automatically ramped at a rate set by the ramp adjust control

3.5.4 Display Controls

Peak - Causes stored peak torque level to be displayed on torque readout. (Overall accuracy = ±1% of span & torque transducer accuracy).

Hold - Causes torque and speed readouts to latch (last reading)

Reset - Dumps peak circuits and resets peak and hold controls

3.5.5 Analog Outputs

Torque - 0 to ±10 VDC = 0 to ±100% torque (Overall accuracy = ±0.2% of span & torque transducer accuracy)

Speed - (2600 system only) 1 VDC per 1000 RPM (Overall accuracy = ±0.1% of span & speed transducer accuracy)

4.0 MAINTENANCE

4.1 Introduction

The instructions outlined in this section are the basic techniques that are recommended to maintain system accuracies. Only those circuits or instruments which require calibration procedures will be covered. Required test equipment will be covered per assembly. As with all instruments of this type, maintenance of this equipment requires a skilled technician with a basic understanding of system design.

4.2 Transducers

No maintenance on the transducers is recommended beyond calibration.

4.2.1 Static Calibration, Introduction (Torque Transducer)

The torque transducer should not require frequent recalibration. However, it may be necessary if it is suspected that the shaft has been overstressed or unless routine calibration checks are required. Calibration adjustments should only be attempted when it becomes necessary and only when the proper required equipment is available. Calibration of the torque transducer is accomplished by attaching a calibration beam to the torque transducer input shaft and locking to output end of the transducer shaft. By placing a known weight to the right side of the calibration beam at a prescribed distance from the shaft axis, a CW torque will result. This torque is the product of the distance of the weight from the shaft axis and the weight. By placing the weight to the left side of the calibration beam, a CCW torque will result. Adjustments are made with a trimmer type resistor located in the torque transducer and the "Zero Adjust" potentiometer located on the instrument package.

4.2.2 Required Equipment

Vibrac #B-7951 Calibration Kit

4.2.3 Initial Calibration Check (See Drawing #B-7951)

Attach the calibration beam to the input shaft of the torque transducer. Lock the output end of the shaft and level the calibration beam. Hang the 100% weight on the right hand side of the beam and record the torque readout. Repeat this process for the 75%, 50%, and 25% weights. Repeat the entire process with the weights on the left side of the beam. The results should be linear ±0.5% of full-scale torque.

4.2.4 Calibration Procedures

Attach the calibration beam to the input shaft of the torque transducer. Lock the output end of the shaft and level the calibration beam. Hang the 100% weight on the right side of the beam and adjust the "Zero Adjust" potentiometer for a 100% torque reading and remove the weight. Hang the 100% weight on the left side of the beam, and remove the hold plug on the torque transducer which conceals the trim adjust potentiometer. Record the torque reading. If the reading is lower than -100%, adjust the trimpot inside the transducer to obtain a reading above the -100% level by the same percentage of error that was recorded. Remove the weight and repeat the process until the transducer is within the ±0.5% tolerance. Repeat the calibration check described in 4.2.3 and check for hysteresis.

4.2.5 Speed Transducers

Calibration of the speed transducer requires a velocity standard such as a synchronous motor or a velocity comparison device such as a strobe light, etc. to calibrate the DC tachometer and remove the test head cover. Couple the prime mover to the test head. Allow the spindle to be driven at 1000 RPM and adjust the calibration trimmer located under the test head cover for a reading of 1000 RPM on the speed readout. Check linearity at several other speeds and correct if necessary. The results should be within .5% of span.

4.3 DTR4600 And Model 2600 Readout/Control Instrument

Maintenance and calibrating procedures will require the following test equipment. A precision DC current and voltage source, DC voltmeter, and an oscilloscope.

If frequent maintenance and calibration checks are to be performed, it is recommended that a transducer mock-up cable be fabricated. This cable could be utilized to the transducer substitution signals. The cable would require a length of coaxial cable and an Amphenol part number 17-20090 connector and 17/301/1 cable housing, or the cable could be purchased from Vibrac.

For the torque transducer simulation signal, connect a length of coaxial cable from the precision current source to pins 7 and 1 of the connector. (The return connection is made through pin 1). The calibration and accuracy checks that are to follow may be completed by removing the instrument chassis and reconnecting the chassis to power on a suitable work bench.

4.3.1 Torque Signal Conditioner

To check the accuracy of the torque signal conditioner, insert the dummy torque transducer simulation signal into the transducer input connector. Connect the test DC voltmeter to the torque analog output connector, or connect the test DC meter to TP4 and the torque signal return ground (most convenient location is the shield of torque analog output connector). With a zero dummy torque input signal, check for any offset voltage on the DC voltmeter. The offset should be within $\pm$2 MV. If the offset is out of the acceptable limits, adjust the trimmer R57 (torque offset adjust) to read zero volts on the test DC voltmeter. Adjust the dummy torque input to -100 micro-amperes, and the DC voltmeter should read +10.00 volts. Adjust the dummy torque input for +100 micro-amperes, the DC voltmeter should

read -10.00 volts. Adjust the dummy torque signal to check various points between the ±100% points. The acceptable limits are to be within ±0.1% os full-scale (see figure 1-3 for location). Connect the DC voltmeter to TP6 and adjust the dummy torque input to -100 micro-amperes, the DC voltmeter should read +10.00 volts. Adjust the dummy torque input to +100 micro-amperes, the DC voltmeter should read +10.00 volts. The acceptable limits are to be within ±.25% of full-scale. If the output is out of the acceptable limits, adjust the trimmer R79 (rectifier adjust) to correct the output within acceptable limits (See Figure 1-3 for trimmer location). This adjustment may require several trials.

4.3.2 Lamp Driver Circuit

No maintenance is required for this circuit, however, we will note that the torque transducer lamp voltage may be monitored at TP1 and chassis ground.

4.3.3 Peak Torque Detector and Hold Circuit

To check the calibration of the peak torque circuit, insert the dummy torque input signal as described in 4,3,1. Connect the DC voltmeter to TP3 and the torque signal return ground. Press the "Reset" push-button switch and press the "Peak" push-button switch, adjust the dummy torque input signal to -100 micro-amperes. The DC voltmeter should read +10.00 volts. Adjust the dummy torque input to zero, the DC voltmeter should read +10.00 ±0.25% with a maximum allowable decay rate of 0.120% of full-scale per second. Press the "Reset" push-button switch and adjust the dummy torque input signal to +100 micro-amperes, press the "Peak" push-button switch, and the DC voltmeter should read +10.00 volts ±0.25% with a maximum decay rate of 0.1% of full-scale per second. Press the "Reset" push-button switch and adjust the dummy torque input signal to check various points

between ±100% points. The acceptable linearity limits are to be within ±1% of full-scale.

4.3.4 Digital Displays

See manufacturers manual

4.3.5 Stall Torque

To set the maximum stall torque level, adjust the stall torque set trimmer on the digital board to the desired level (See Figure 1-3 for trimmer location).

NOTE: This torque setting must accomplished dynamically.

4.4 System Calibration

4.4.1 Required Test Standards

Accuracy checkouts and calibration require the use of precision test standards. The customer should carefully understand the component accuracies and provide for the appropriate test equipment for calibrating purposes. It is recommended that routine calibration checkouts be performed on the instrument to certify that the MUT test data accumulated is accurate and repeatable. It will be noted that the listing of the calibration standards to be described are recommended examples of suitable testing standards for Dynomometer instruments, however, customer requirements govern the actual needs for such equipment.

The following equipment is recommended:

4.4.2 Torque Transducer Certification

A calibration kit for each transducer which includes a set of NBS class 5 weights and a calibration beam which mounts on the transducer shaft. (See Drawing #B-7951).

4.4.3 General Calibration Certification

Calibration certification may be easily accomplished on a routine basis by testing for readout accuracy with the appropriate testing standards. For example, if the instrument is used for incoming inspection, testing it may be desirable to certify the system on a weekly basis by completing the following calibration checks:

1. Torque transducer calibration checkout as described in 4.2
2. Signal conditioner calibration checkout as described in 4.3 and 4.4

4.4.4 System Calibration Procedures

To run a complete system calibration, perform the following sequence of procedures:

4.4.4.1 Turn power on and allow for a one hour warm-up period

4.4.4.2 Perform maintenance and calibration procedures for the display instrument as described in Section 4.3

4.4.4.3 Perform maintenance and calibration instructions for the torque transducer as described in Section 4.2

5.0 SCHEMATICS

5.1 Schematics

Drawing #	Description
D-8467	Schematic Circuit Card (Mdl. 2600)
D-8468	Schematic Circuit Card (Mdl. 4600)
D-8640	Schematic Front Panel (Mdl. 2600 & 4600)
D-8641	Schematic Chassis Wiring (Mdl. 2600 & 4600
B-8013	Schematic Scaler Torque
B-7951	Calibration Kit

6.0 MANUFACTURER'S MANUALS

6.1 Power Supplies

6.2 Digital Panel Meters

POWER-ONE INC.
DC POWER SUPPLIES

APPLICATION DATA
INCLUDING:
1. Schematic
2. Parts Lists
3. Specification
4. Outline & Mounting Drawing
5. General User Information

MODEL
BAA-40W
Triple Output
w/Dual Tracking

SPECIFICATIONS:

AC Input: 105-125 VAC, 47-440 HZ (Derate unit 15% at 50 HZ operation)

DC Output:

OUTPUT POWER	
5V. or 6V.	±12V. or ±15V.
3.0A or 2.5A	1.0A or 0.8A.

Line Regulation: ±.01% for a 10V. input change
Load Regulation: ±.02% for a 50% load change
Output Ripple: 3.0mV PK-PK, 0.4mV RMS
Transient Response: 300 seconds for 50% load change
Overload & Short Circuit Protection: Automatic current limit/foldback
Reverse Voltage Protection: Reverse protection diodes across output and on pass transistors
Remote Sensing: Provided, connection for local sense not required
Stability: ±0.05% for 24 hours after warm-up
Input Fusing: Recommended fuse at 2.0A.
Temperature Coefficient: 0.01%/°C maximum
0.002%/°C typical
Cooling: Units are full rated to 50°C in free air, must be derated or fan cooled when mounted in confined area
Temperature Rating:

0 - 50°C - 100%
60°C - 70%
71°C - 40%

Efficiency: Combined efficiency approx. 55% @ 115 VAC full load on all outputs
Note: In systems where the AC voltage is controlled, operate at 108-110 VAC for greatest efficiency
Construction: All aluminum chassis
Weight: 5 lbs.
Vibration: Per Mil-Std-810B, Method 514, Procedure I, Curve AB (to 50 HZ)
Shock: Per Mil-Std-810B, Method 516, Procedure V.

2 YEAR GUARANTEE

POWER-ONE will repair or replace any power supply of its manufacture that does not perform to published specifications as a result of defective materials or workmanship for a period of 2 years from date of original purchase. No other obligations or liabilities are implied or expressed. Returns must be freight prepaid.

TROUBLESHOOTING GUIDE

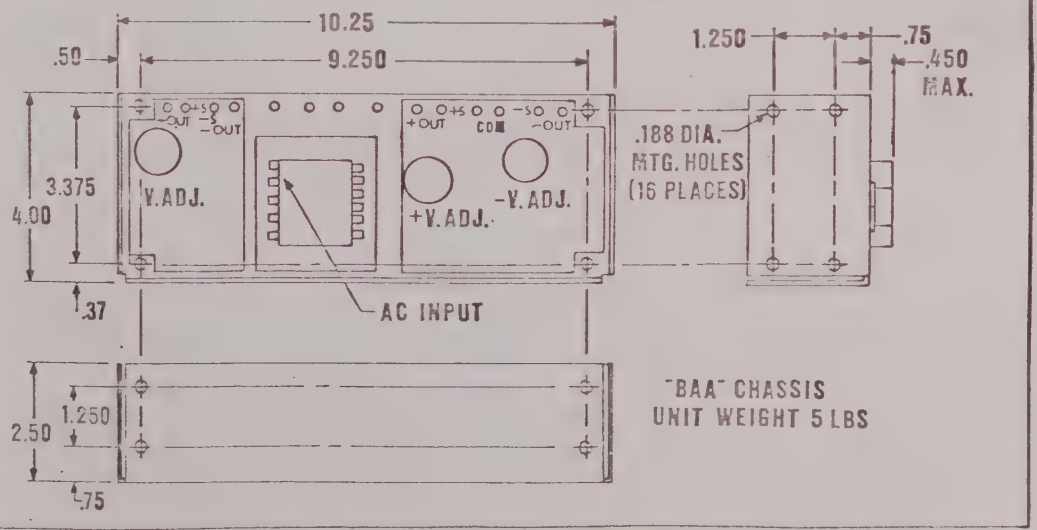
Refer to voltage tests points shown on schematic for ease of failure determination

MODEL B

SYMPTOM	POSSIBLE PROBLEMS
Unit Overheating	1. Output Overloaded 2. Inadequate Ventilation 3. Improper Transformer Primary Connector 4. High Input AC Voltage
Low Output Voltage with High Ripple	1. Output Overloaded 2. U1 Faulty 3. CR1, CR2 or CR3 Open 4. C1 or C2 Leaky 5. Q1 or Q2 Open 6. R16 Open
High Output Voltage and Ripple Poor Regulation	1. Q1 or Q2 Shorted 2. U1 Faulty 3. CR4 Shorted 4. R17 Open
High Input Current Blows Fuses	1. Improper Input Voltage or Frequency 2. C1 or C2 Shorted 3. CR1, CR2 or CR3 Shorted

MODEL AA

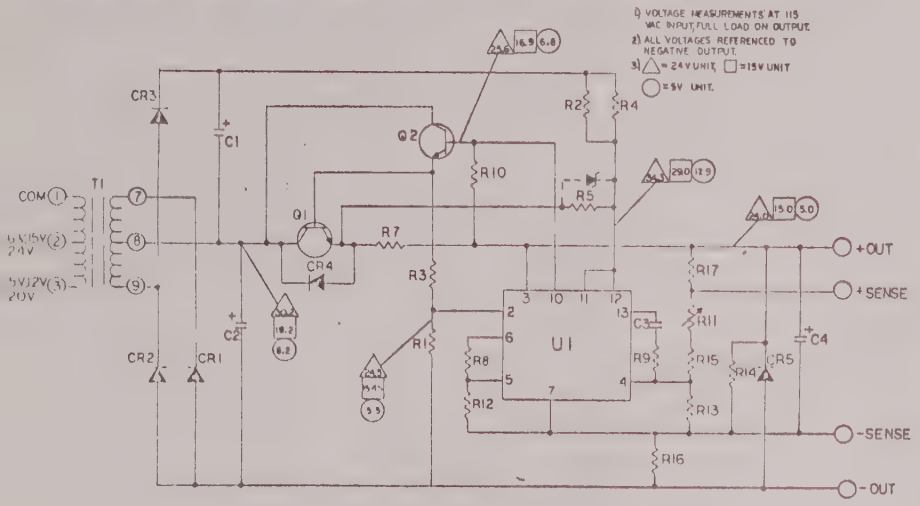
SYMPTOM	POSSIBLE PROBLEMS
Unit Overheating	1. Output Overloaded 2. Inadequate Ventilation 3. Improper Transformer Primary Connecton 4. High Input AC Voltage
Low Output Voltage with High Ripple	1. Output Overloaded 2. U1 or U2 Faulty 3. CR1, CR4 or CR5 Open 4. C1, C2 or C3 Leaky 5. Q1 or Q2 Open 6. R27 Open
High Output Voltage and Ripple, Poor Regulation	1. Q1 or Q2 Shorted 2. U1 or U2 Faulty 3. CR6 or CR7 Shorted 4. R28 or R29 Open
High Input Current Blows Fuses	1. Improper Input Voltage or Frequency 2. C1, C2 or C3 Shorted 3. CR1, CR4 or CR5 Shorted
Unit Will Not Come On - Either or Both Outputs	1. Constant Current Load (Too high for foldback circuit) 2. Excess Common Mode Current Note: In either condition, short circuit current can be increased by installing R11 and or R14. Do not set above 0.5A.



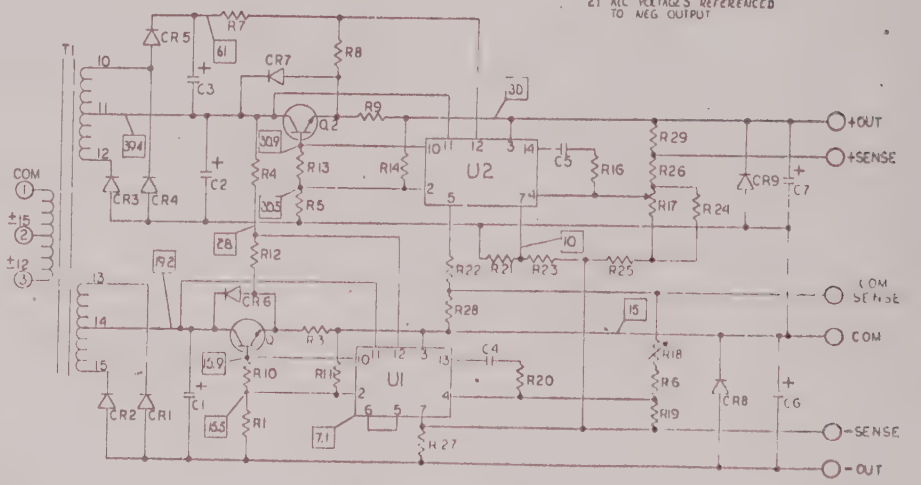
"BAA" CHASSIS
UNIT WEIGHT 5 LBS

REF DES	B5-3 O	B15-1.5	B24-1.2	DESCRIPTION
C1,4	100/35	47/50	47/50	CAPACITOR ELECT
C2	3300/35	3300/35	1800/50	CAPACITOR, ELECT
C3	.001/100	.001/100	.001/100	CAPACITOR, FILM
CR1,2	AE3B	AE3B	AE3B	DIODE, 3A, 100V
CR3,4,5	AE1C	AE1C	AE1C	DIODE, 1A 200V
R1	3.3K	4.7K	4.7K	RESISTOR, ½W, C.F. 5%
R2	330Ω	330Ω	220Ω	
R4	47Ω	2.2K	10K	
R5	—	4.7K	IN752A	
R6	2.2K	750Ω	2.2K	
R8	2.2K	750Ω	22K	
R11	2.2K	—	—	
R12	—	750Ω	2.2K	
R15	6.8Ω	—	—	
R16,17,19	6.8Ω	6.8Ω	6.8Ω	
R7	12Ω	.22Ω	.39Ω	2W, W.W. 10%
R13	1.6K	1.6K	750Ω	½W, M.F. 2%
R14	—	750Ω	1K	RESISTOR, ½W M.F. 2%
R18	15K	15K	1.5K	POTENTIOMETER, 1W W
Q1	12500-3	12500-3	12500-3	TRANSISTOR, POWER
Q2	2N2219A	2N2219A	2N2219A	TRANSISTOR SIGNAL
U1	μA723	μA723	μA723	I.C. VOLTAGE REGULATOR
T1	11023	082-11023	13187	082-13187	13189	082-13189	POWER TRANSFORMER
P.C.B	11020	081-11020	11020	081-11020	11020	081-11020	P.C. BOARD
CHASSIS	11021	083-11021	11021	083-11021	11021	083-11021	CHASSIS, ALUM.

REF DES.	AA 15 0.8	SEE PA	DESCRIPTION
C1,2	[illegible]	[illegible]	CAPACITOR, ALUM. ELECT.
C3,6,7	[illegible]	[illegible]	ALUM ELECT.
C4,5	.001/100V	[illegible]	CAPACITOR MYLAR
CR1-9	AE1C	111-10251	DIODE 1A 200V
Q1,2	12500-3	171-10261	TRANSISTOR
U1,2	μA723	130-10287	I.C. VOLTAGE REGULATOR
R1,5,8,12,22	47K	151-10381	RESISTOR ¼W 5% CF
R3,9	5Ω	151-10349	
R4,7	2.2K	151-10373	
R10,13	300Ω	151-10356	
R23	1K	151-10365	
R24	82Ω	151-10337	
R16,20,27,28,29	6.8Ω	151-10313	5% CF
R6,21	750Ω	152-10502	2% MF
R19,25,26	1.6K	152-10510	RESISTOR ½W 2% MF
R17,18	1.5K	155-10085	POTENTIOMETER 2W WW
R11,14	—	—	RESISTOR
T1	11093	082-11093	TRANSFORMER
PCB	11090	505-11090	P.C. BOARD
CHASSIS	11091	412-11091	CHASSIS



PRODUCTION NOTES:
1) VOLTAGE MEASUREMENT AT 115 VAC INPUT FULL LOAD ON OUTPUT
2) ALL VOLTAGES REFERENCED TO NEG OUTPUT



IMPORTANT:

This power supply features Remote Sensing capability. Remote Sensing Terminals are provided for customer hook-up when used in applications utilizing this feature.

When not using Remote Sensing, or when testing the unit to its' specifications, the Remote Sensing Terminals should be connected to their respective Output Terminals as follows:

+S to + OUT
-S to - OUT

POWER-ONE INC.
D.C. POWER SUPPLIES

APPLICATION DATA SHEET

INFORMATION CONTAINED:
1. SCHEMATIC
2. PARTS LIST
3. SPECIFICATION
4. OUTLINE AND MOUNTING
5. GENERAL USER INFORMATION

MODEL HC 12-3.4 , HC 15-3.0, HC 24-2.4, HC 28-2.0

EDITION NO. 3

A.C. INPUT	115/230VAC ±10% 47-440HZ (DERATE OUTPUT CURRENT 10% FOR 50HZ OPERATION)
D.C. OUTPUT	SEE OUTPUT RATING CHART. ADJUSTMENT RANGE, ±5% MINIMUM.
LINE REGULATION	±.05% FOR A 10% LINE CHANGE.
LOAD REGULATION	±.05% FOR A 50% LOAD CHANGE.
OUTPUT RIPPLE	2 TO 15V UNITS: 5.0mv. PK-PK MAXIMUM. 20 TO 200V. UNITS: .02% PK-PK MAXIMUM.
SHORT CIRCUIT & OVERLOAD PROTECTION	AUTOMATIC CURRENT LIMIT / FOLDBACK.
REMOTE SENSING	PROVIDED, ON ALL N, D & E MODELS. OPEN SENSE LEAD PROTECTION BUILT-IN.
TEMPERATURE RATING	0° TO 50°C FULL RATED, DERATE LINEARLY TO 40% AT 70°C.
TEMP. COEFFICIENT	±.03%/ °C MAXIMUM .010 % / °C TYPICAL.
EFFICIENCY	5V. UNITS: 45%, 12 & 15V. UNITS: 55%, 20 & 24V. UNITS: 60%.
VIBRATION	PER MIL-STD-810C; METHOD 514, PROCEDURE X.
SHOCK	PER MIL-STD-810C; METHOD 516, PROCEDURE V.
OVERVOLTAGE PROTECTION	BUILT IN ON ALL 5V. MODELS SET @ 6.2V. ± 4V. OTHER MODELS USE OPTIONAL OVERVOLTAGE PROTECTION.
TRANSIENT RESPONSE	50 μ SECONDS FOR A 50% LOAD CHANGE
STABILITY	±.3% FOR 24 HOURS AFTER WARM UP.
COOLING	CONVECTION COOLING IS ADEQUATE WHERE NON RESTRICTED AIR FLOW IS AVAILABLE. WHEN OPERATING IN A CONFINED AREA, MOVING AIR OR CONDUCTION COOLING IS RECOMMENDED.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

AC CONNECTION TABLE

FOR USE AT	115V A.C.	230V A.C.
JUMPER	1 & 3, 2 & 4	2 & 3
APPLY A.C. AT	1 & 4	1 & 4
FUSE INPUT AT	1.0A	0.5A

OUTPUT RATING CHART

MODEL	VOLTS	AMPS STEADY	AMPS SURGE	OVP
HC12-3.4	12	3.4		
HC15-3.0	15	3.0		
HC24-2.4	24	2.4		
HC28-2.0	28	2.0		

WARRANTY

POWER-ONE WARRANTS EACH POWER SUPPLY OF ITS MANUFACTURE THAT DOES NOT PERFORM TO PUBLISHED SPECIFICATIONS, AS A RESULT OF DEFECTIVE MATERIALS OR WORKMANSHIP, FOR A PERIOD OF TWO (2) FULL YEARS FROM THE DATE OF ORIGINAL DELIVERY. RETURNS MUST BE FREIGHT PREPAID.

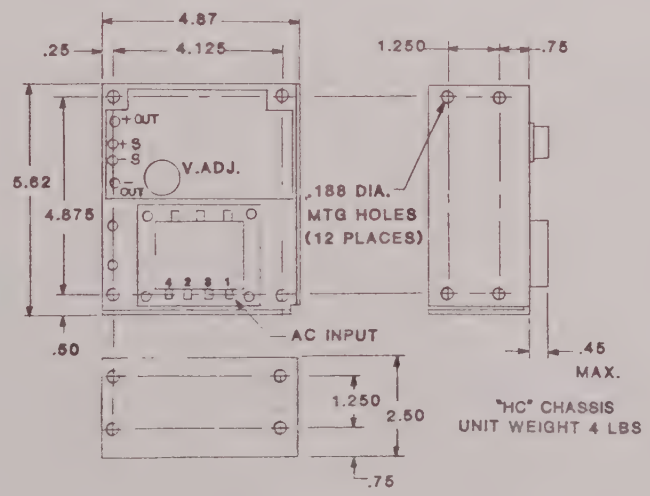
POWER-ONE ASSUMES NO LIABILITIES FOR CONSEQUENTIAL DAMAGES OF ANY KIND THROUGH THE USE OR MISUSE OF ITS PRODUCTS BY THE PURCHASER OR OTHERS. NO OTHER OBLIGATIONS OR LIABILITIES ARE EXPRESSED OR IMPLIED.

IMPORTANT:

THIS POWER SUPPLY FEATURES REMOTE SENSING CAPABILITY. REMOTE SENSING TERMINALS ARE PROVIDED FOR HOOK-UP WHEN USED IN APPLICATIONS UTILIZING THIS FEATURE.

WHEN NOT USING REMOTE SENSING, OR WHEN TESTING THE UNIT TO ITS SPECIFICATIONS, THE REMOTE SENSING TERMINALS SHOULD BE CONNECTED TO THEIR RESPECTIVE OUTPUT TERMINALS AS FOLLOWS:

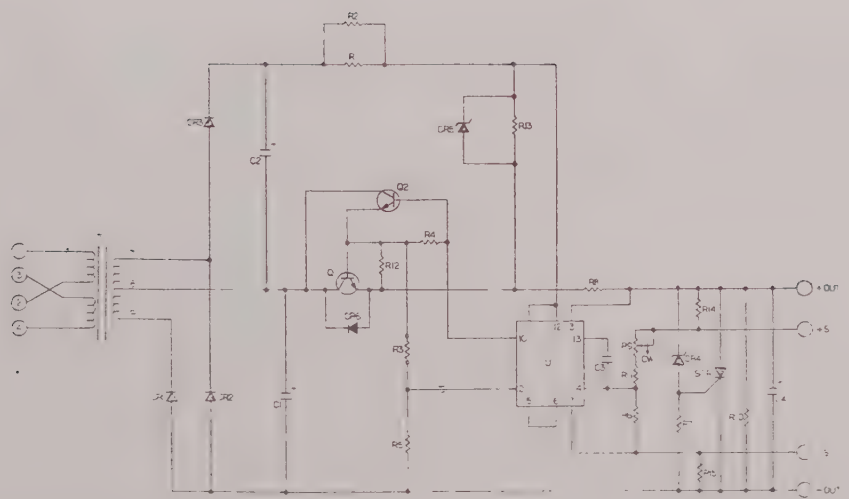
+S to + OUT
-S to - OUT



"HC" CHASSIS
UNIT WEIGHT 4 LBS

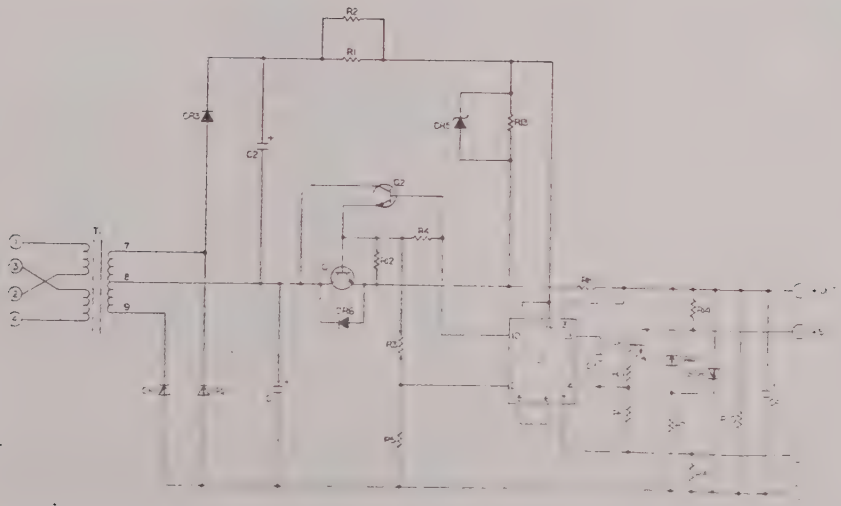
REF DES	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION HC12	POWER-ONE STD P/N
C4	.1/100V	CAPACITOR, MYLAR	104-10093
C2 &	100/35V	CAPACITOR, ALUM. ELECT	101-10110
C1	35V	CAPACITOR, ALUM. ELECT	102-10098
CR5	1N752A	DIODE, ZENER	112-10006
CR4		DIODE, ZENER	
CR3,6	1N4003	DIODE, 1A, 200V	111-10251
CR1,2	1N5401	DIODE 3A, 100V	111-10252
SCR1		SCR 3A	
Q2	2N6559	TRANSISTOR	172-10249
Q1	2N6609	TRANSISTOR	171-10261
U	1A 723	I.C. VOLTAGE REGULATOR	130-10287
RP	.12Ω	RESISTOR, 2W. WW. 5W.H	158-10077
R10	.1Ω	RESISTOR, ½W. 5% C.F	
R7	1.5Ω		151-10375
R4,12	0.2Ω		151-10373
R	2.2Ω	RESISTOR, ½W, 5%, C.F.	151-10372
R6	2K	RESISTOR ½W. 2% M.F.	152-10512
R1,12			
R2			
R14,15	6.8Ω	RESISTOR, ½W, 5% C.F	151-10383
R3	300Ω	RESISTOR, ½W, 5% C.F	151-10252
R11	330Ω	RESISTOR, ½W, 5% C.F	151-10353
R5	1.5K	POTENTIOMETER	155-10085
P.C.B.	12126	PRINTED CIRCUIT BOARD	505-12126

PARTS LIST



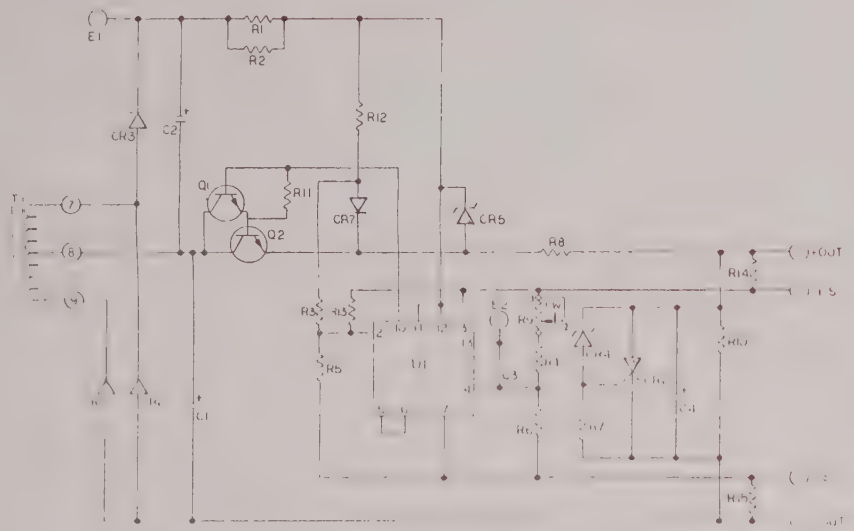
QTY REQD	ITEM	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION HC15	POWER-ONE STD P/N
C3		.001/100V	CAPACITOR, MYLAR	104-10093
C4		100/35V	CAPACITOR, ALUM ELECT	101-10110
C1		7300/35V	CAPACITOR, ALUM ELECT	102-10098
CR5		IN752A	DIODE, ZENER	112-10006
CR4			DIODE, ZENER	
CR3,6		IN4003	DIODE, 1A, 200V	111-10251
CR1,2		IN5401	DIODE, 3A, 100V	111-10252
SCR1			SCR 3A	
Q2		2N6551	TRANSISTOR	172-10249
Q1		2N6569	TRANSISTOR	171-10261
U1		µa 723	I.C. VOLTAGE REGULATOR	130-10287
R8		.18Ω	RESISTOR, 2W, WW, BWH	158-10078
R11		2K	RESISTOR, ½W, 2% METAL	152-10512
R10		1K	RESISTOR, ½W, 5% CARBON	151-10365
R6		7K		152-10515
R5		4.7K		151-10381
R4,12		2.2K		151-10373
R1		2.0K	RESISTOR, ½W, 5% CARBON	151-10372
R7,13				
R2				
R4,14		2.5Ω	RESISTOR, ½W, 5% CARBON	151-10313
R3			RESISTOR, ½W, 5% CARBON	
R9		5K	POTENTIOMETER	155-10085
PC 6		12126	PRINTED CIRCUIT BOARD	505-12126

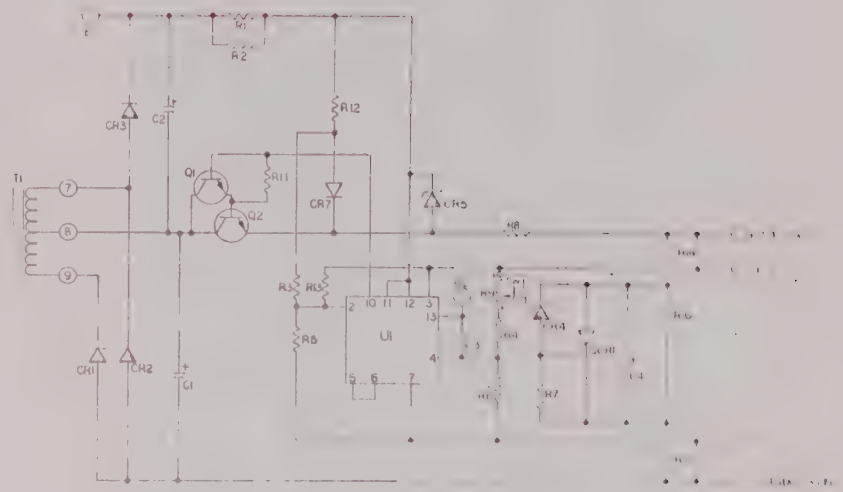
PARTS LIST



REF. DES.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION HC28	POWER-ONE STD P/N
		PARTS LIST	
C1	3700/60	CAPACITOR, ALUM. ELECT.	102-10102
C2,4	47/50	CAPACITOR, ALUM. ELECT.	101-10112
C3	.001/100	CAPACITOR, MYLAR	104-10093
CR1,2	IN5401	DIODE, 3A, 100V	111-10252
CR3,7	IN4003	DIODE, 1A, 200V	111-10251
CR4		ZENER	
CR5	IN752A	DIODE, ZENER	112-10006
SCR1		SCR, 3A	
Q1	2N6551	TRANSISTOR	172-10249
Q2	2N6569	TRANSISTOR	171-10261
U1	µA723	I.C. VOLTAGE REGULATOR	130-10287
R1,2	10K	RESISTOR, ½W, 5%, CF	151-10389
R3	820Ω		151-10363
R5	47K		151-10405
R7			
R10,11	2.2K		151-10373
R12	1.6K		151-10370
R13	27K		151-10399
R14,15	6.8Ω	5%, CF	151-10313
R4	4.7K	2%, MF	152-10521
R6	1.8K	½W, 2%, MF	52-10511
R8	.22Ω	RESISTOR, 2W, BWH	158-10079
R9	15K	POTENTIOMETER	155-10085
T1		TRANSFORMER	082-12250
PCB		PRINTED CIRCUIT BOARD	505-12632

REF. DES.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION HC24	POWER-ONE STD P/N
		PARTS LIST	
C1	3700/60	CAPACITOR, ALUM. ELECT.	102-10102
C2A	47/50	CAPACITOR, ALUM. ELECT.	101-10112
C3	500pF/100	CAPACITOR, MYLAR	105-10089
CR1,2	IN5401	DIODE, 3A, 100V	111-10252
CR3,7	IN4003	DIODE, 1A, 200V	111-10251
CR4		ZENER	
CR5	IN752A	DIODE, ZENER	112-10006
SCR1		SCR, 3A	
Q1	2N6551	TRANSISTOR	172-10249
Q2	2N6569	TRANSISTOR	171-10261
U1	µA723	I.C. VOLTAGE REGULATOR	130-10287
R1,2	7.5K	RESISTOR, ½W, 5%, CF	151-10386
R3,10	1.2K		151-10361
R5	47K		151-10405
R7			
R11	2.2K		151-10373
R12	1K		151-10365
R13	20K		151-10396
R14,15	6.8Ω	5%, CF	151-10313
R4	4.7K	2%, MF	152-10521
R6	2.4K	½W, 2%, MF	152-10514
R8	.22Ω	RESISTOR, 2W, BWH	158-10079
R9	1.5K	POTENTIOMETER	155-10085
T1		TRANSFORMER	082-12057
PCB		PRINTED CIRCUIT BOARD	505-12632





ANALOG DEVICES

Low Cost 4½ Digit DPMs With LED Displays

AD2024/AD2027

FEATURES
"Second Generation" MOS-LSI Design
Large 0.43" (11mm) LED Displays
4½ Digit Resolution – 20,000 Counts Full Scale
Limited Differential Input
Either Line Powered (AD2024) or Logic Powered (AD2027)
Industry Standard Case Designs

APPLICATIONS
High Resolution/High Accuracy Readout for:
Test Equipment
Process Control Instrumentation
Analytical and Scientific Instruments

GENERAL DESCRIPTION

The AD2024 and AD2027 are low cost 4½ digit DPMs with large LED displays. Both units offer the same features and identical performance, but the AD2024 is AC line powered and the AD2027 is +5VDC powered.

THE BENEFITS OF SECOND GENERATION DESIGN

The AD2024 and AD2027 are designed around MOS-LSI (Metal Oxide Semiconductor, Large Scale Integration) integrated circuits which greatly reduce the number of components and interconnections required to provide the performance and features expected in a high resolution 4½ digit DPM.

This "Second Generation" design, therefore, offers greatly increased reliability and significantly lower cost at little compromise in performance. The large 0.43 inch (11mm) LED displays offer the brightness and readability previously available only with gas discharge displays with the added advantage of an all solid state component.

HIGH RESOLUTION AND VERSATILE FEATURES

These DPMs measure DC input voltages over a full scale range of ±1.9999V with an accuracy of ±0.005% reading ±0.005% of full scale ± 1 digit. Using the "limited differential" input first used by Analog Devices on the AD2010, the AD2024 and AD2027 prevent ground loop problems and provide 50dB of common mode rejection at common mode voltages up to ±200mV. Normal mode rejection is 25dB at 50–60Hz.

BCD data outputs are provided in a bit parallel, character serial format compatible with CMOS logic systems. When applications require parallel BCD data, such as interfaces to printers, comparators or slave displays, parallel BCD output options are available that are compatible to standard TTL logic systems.

External power supply outputs at +5V and -25V (-25V only on the AD2027) are made available for powering external circuitry. In addition, control inputs for conversion "Hold", display blanking and decimal point selection are provided.

INDUSTRY STANDARD CASE DESIGNS

Although both the AD2024 and AD2027 have identical electrical designs, they are packaged in the case sizes that have become industry standards for AC line powered and +5VDC logic powered DPMs respectively. The AD2024 fits the 3.924" x 1.682" (99.67 x 42.74mm) panel cutout common to most AC line powered DPMs, and the AD2027 fits the 3.175" x 1.810" (80.65 x 45.97mm) panel cutout of the Analog Devices logic power case design, now used by several other manufacturers of logic powered DPMs. Thus, interchangeability is assured, allowing mechanical second sourcing for both these DPMs.

DESIGNED AND BUILT FOR RELIABILITY

Even beyond the reliability advantages of the LSI-IC design and LED displays, the AD2024 and AD2027 have had extreme care taken in their design and manufacture to insure reliability. Manufacturing processes are monitored by continual quality assurance inspections to insure proper workmanship and testing. Automatic test equipment is used to test each DPM thoroughly and without error. And each AD2024 and AD2027, like every Analog Devices DPM, receives a full one week failure-free burn-in before shipment.

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices.

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Tel: 617/329-4700 TWX: 710/394-6577
West Coast 213/595-1783 Mid-West 312/894-3300 Texas 214/231-5094

SPECIFICATIONS (typical at +25°C and nominal power supply voltage)

DISPLAY OUTPUTS
- Seven Segment LED Display, 0.43" (11mm) high, for four data digits. 100% overrange and polarity indication.
- Overload indication by blanking all digits, polarity sign remains valid.
- Decimal points (4) selectable at input.
- Display Blanking

ANALOG INPUT
- Configuration: Bipolar, limited differential
- Full Scale Range: ±1.9999V (consult factory or representative for other input ranges)
- Automatic Polarity
- Input Impedance: 100MΩ
- Bias Current: 30nA
- Overvoltage Protection: 120V RMS sustained

ACCURACY
- ±0.005% reading ±0.005% full scale ±1 digit [1]
- Resolution: 100μV
- Temperature Range[2]: 0 to +50°C operating. -20 to +85°C storage. (AD2024/B: 0 to +45°C operating)
- Temperature Coefficient: Gain: ±30ppm/°C. Zero Offset: ±10μV/°C
- Warmup Time: One minute to rated accuracy
- Settling Time to Rated Accuracy: 450ms

NORMAL MODE REJECTION
- 25dB at 50–60Hz

COMMON MODE REJECTION
- 50dB, DC to 1kHz, ±200mV common mode voltage
- AD2024 (floated on power supply transformer if data outputs and control signals are not used) – 110dB at 120V RMS common mode voltage, 1kΩ imbalance at input.

CONVERSION TIME
- 180ms for full scale reading
- 210ms for overload conversion

CONVERSION RATE
- 5 conversions per second

DIGITAL INTERFACE SIGNALS
- Inputs

  Display Blank – (DTL/TTL Compatible, 4 TTL Loads). Logic "0" or grounding blanks display, including polarity sign, but not decimal points. The display is valid immediately upon removal of the blanking signal.

  Hold – (DTL/TTL Compatible, 2 TTL Loads). Logic "0" or grounding causes the DPM to hold and display the last conversion. Upon removal of the hold, the DPM resumes conversions.

  Decimal Points – (Not TTL Compatible). Logic "0" or grounding turns on appropriate decimal point. External circuitry must sink 35mA when a decimal point is illuminated.
- Outputs

  DTL/TTL Compatible[3] – Status. Logic "1" indicates conversion in process. All digital outputs are valid when status is at logic "0". 6 TTL loads. – Polarity. Logic "1" indicates positive polarity, latched. 6 TTL loads.

  CMOS Compatible – Overload, Logic "1" indicates overload (≥20,000), latched. – BCD outputs. 4½ BCD digits, character serial, bit parallel, not TTL compatible.

  Parallel BCD Output (Option "B"). – 4½ BCD digits, positive true, latched. Drives 5 TTL loads. – Data Ready. Logic "1" indicates output data is valid. Drives 2 TTL loads.

EXTERNAL POWER SUPPLY OUTPUTS
- AD2024: +5V at 25mA, -25V at 5mA
- AD2027: -25V at 5mA

POWER SUPPLY INPUTS
- AD2024: AC line, 50–60Hz, 4W
- AD2027: +5VDC, ±5% at 750mA

CALIBRATION ADJUSTMENTS
- Gain
- Zero
- Recommended recalibration interval: 6 months

SIZE
- AD2024: 3.92"W x 1.67"H x 4.48"D (100 x 42 x 114mm)
  Panel cutout: 3.930" x 1.682" (99.8 x 42.7mm)
- AD2027: 3"W x 1.8"H x 4"D (76 x 46 x 102mm)
  Panel cutout: 3.175" x 1.810" (80.65 x 45.97mm)

WEIGHT
- AD2024: 14 ounces (395 grams)
- AD2027: 10 ounces (280 grams)

OPTIONS – ORDERING GUIDE
- AD2024

  AC Power Inputs

  AD2024 – 117VAC
  AD2024/E – 220VAC
  AD2024/F – 100VAC
  AD2024/H – 240VAC
  } ±10%

  Data Output Options (available with any power input options)
  AD2024 – Character serial data outputs
  AD2024/B – Parallel BCD option

  Display Lens Options[4]
  Lens 7 – Red with ADI logo
  Lens 8 – Red without ADI logo

  Connector – 36 pin, 0.156" spacing, card edge connector, Viking 2VK18D/1-2 or equivalent. – Optional: Order AC2610 at $5.00 each.

  AD2024/B option also requires a 30 pin, 0.156" spacing, card edge connector, Viking 2VK15D/1-2 or equivalent. – Optional: Order AC1501 at $3.50 each.
- AD2027

  Data Output Options
  AD2027 – Character serial data outputs
  AD2027/B – Parallel BCD option

  Display Lens Options[4]
  Lens 5 – Red with ADI logo
  Lens 6 – Red without ADI logo

  Connector – AC1501 (see above) or equivalent. AD2027/B option requires two each.

PRICING

Price Reduction
AD2024 - $201
"B" Option - $16

AD2024 – $207 (1–9) all power supply options
AD2027 – $197 (1–9)
"B" Option – $27.00, additional (1–9) any model
Substantial OEM quantity discounts available.

[1] Guaranteed at +25°C and nominal power supply voltage.
[2] Guaranteed.
[3] For CMOS compatibility, 3.3k pullup resistors to the +5V output of the DPM are required.
[4] If no lens is specified, Lens 5 or 7 is supplied as appropriate.

Specifications subject to change without notice.

APPLYING THE AD2024 AND AD2027

Wiring Connections

Figures 1 and 2 are wiring diagrams for AD2024 and AD2027 applications. The "limited differential" input uses a 100Ω resistor to isolate the analog input from the digital and power supply sections to prevent ground loop problems. The analog input must be connected between the "analog high" and "analog ground" inputs only, since in some applications there may be up to a ±200mV CMV difference between analog and digital grounds.

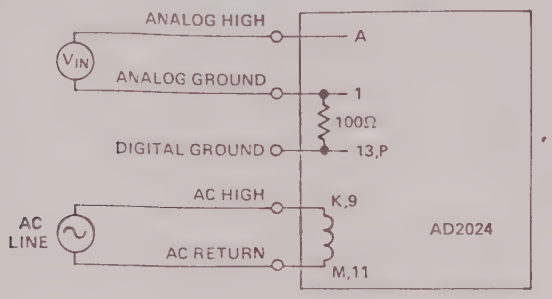


Figure 1. AD2024 Wiring Interconnections

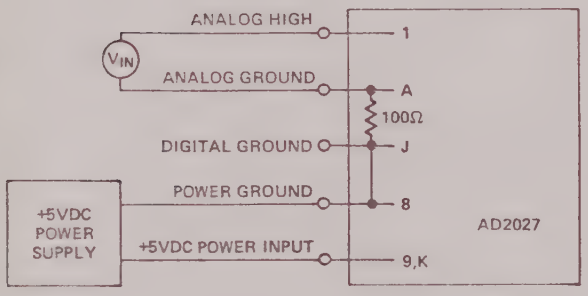


Figure 2. AD2027 Wiring Interconnections

Decimal Points

Grounding or Logic "0" applied to the appropriate pin will illuminate the desired decimal point. This input is not TTL compatible; external drive circuitry must sink 35mA when a decimal point is illuminated.

Display Blanking

Grounding or Logic "0" blanks the display including polarity sign, but not decimal points. The display is valid immediately upon removal of the blanking signal.

Display Hold

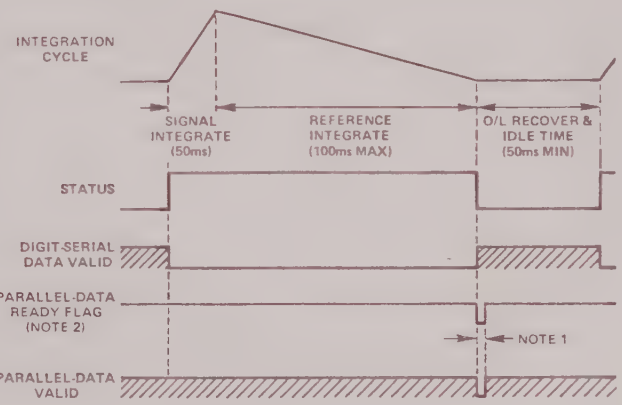
Grounding or Logic "0" causes the DPM to cease conversions. Upon removal of the Hold input, the DPM resumes making conversions.

Interfacing Data Outputs

The standard data outputs are in a bit parallel character serial format compatible to CMOS logic systems. The BCD outputs are multiplexed, and a digit output is provided for each of the five digits of output. Thus, the four BCD lines on the output at a given time are valid for the digit whose digit line is currently high. The bit parallel character serial data is valid when the DPM status line is low for a period of 50msec between each conversion cycle. The overload line is latched output which is at logic "1", whenever the input exceeds the full 20,000 count range.

Optional parallel BCD outputs ("B" option) are available on a separate card which is internally connected to the DPM. The output data then is presented in a full parallel format and is latched. The parallel data is valid whenever the data ready output is high.

Pin connections for the "B" option are shown in the interconnection tables and a full timing diagram is shown in Figure 3.



NOTE 1. Approx. 5msec required to load parallel-out registers.
NOTE 2. B option.

Figure 3. AD2024/AD2027 Timing Diagram

Calibration Procedures

A precision voltage reference is needed to calibrate an AD2024 or AD2027. The location of the calibration potentiometers is shown in Figures 4 and 6. Always calibrate the DPM under normal conditions after warmup, and always adjust the zero offset first, then the gain.

Zero Adjustment: Ground analog high to analog ground and adjust zero offset potentiometer until the DPM reads 0000.

Gain Adjustment: Apply an input of +1.9000V and adjust the gain potentiometer until the DPM reads +1.9000.

PIN	FUNCTION
1	Analog Ground
2	10^1 Digit
= KEY	
3	BCD 2
4	10^3 Digit
5	BCD 8
6	Mux Step
7	+5VDC (Out)
8	NC
9	AC High
10	NC
11	AC Return
12	NC
13	Digital Ground
14	NC
15	Polarity
16	Display Blank
17	DP1XXX.X
18	Overload

PIN	FUNCTION
A	Analog High
B	10^0 Digit (LSD)
= KEY	
C	10^2 Digit
D	BCD 4
E	BCD 1
F	10^4 Digit (MSD)
H	-25VDC (Out)
J	NC
K	AC High
L	NC
M	AC Return
N	NC
P	Digital Ground
R	Status
S	Hold
T	DP1.XXXX
U	DP1X.XXX
V	DP1XX.XX

AD2024 — Signal and Pin Connections

PIN	FUNCTION
1	Analog High
2	10^0 Digit (LSD)
3	BCD 8
4	BCD 2
5	10^4 Digit (MSD)
6	10^3 Digit
7	NC
8	Power Ground
9	+5V (In)
10	NC
= KEY	
11	Display Blank
12	Hold
13	Overload
14	DP1.XXXX
15	DP1XX.XX

PIN	FUNCTION
A	Analog Ground
B	Mux Step
C	BCD 1
D	BCD 4
E	10^1 Digit
F	10^2 Digit
H	-25VDC (Out)
J	Digital Ground
K	+5V (In)
L	NC
= KEY	
M	NC
N	Polarity
P	Status
R	DP1X.XXX
S	DP1XXX.X

AD2027 — Signal and Pin Connections

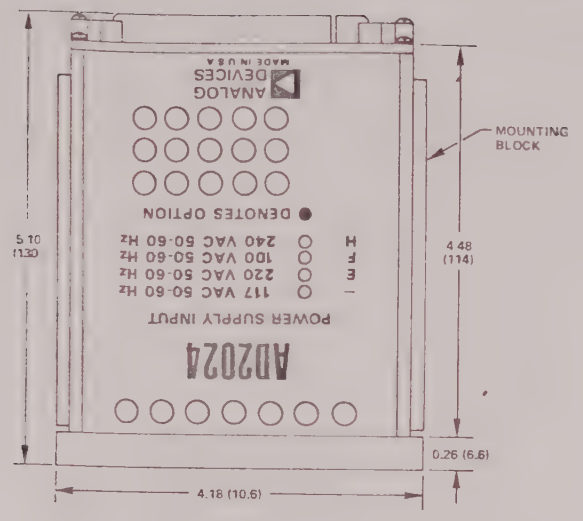
PIN	FUNCTION
1	+5VDC (In)
2	BCD 1 (In)
= KEY	
3	BCD 4 (In)
4	BCD 2000
5	BCD 40
6	BCD 800
7	BCD 100
8	BCD 10,000
9	BCD 20
10	BCD 8
11	BCD 1
12	BCD 400
13	Data Ready
14	Polarity (In)
15	Polarity (Out)

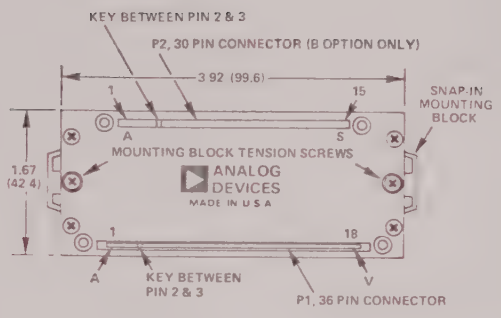
PIN	FUNCTION
A	NC (Do Not Use)
B	BCD 8 (In)
= KEY	
C	BCD 2 (In)
D	BCD 4
E	BCD 80
F	BCD 8000
H	BCD 1000
J	BCD 200
K	BCD 2
L	BCD 10
M	BCD 4000
N	10^4 Digit (In)
P	Status (In)
R	Mux Step (In)
S	Digital Ground

NOTES: 1) Overload output is on main DPM connector.

2) Pins marked "In" are made available for remote placement of BCD option card and are not normally used since all connections are interval.

AD2024/AD2027 BCD Options — Signal and Pin Connections





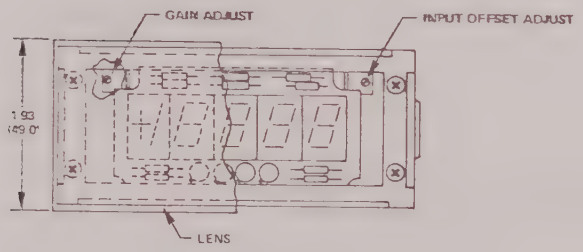
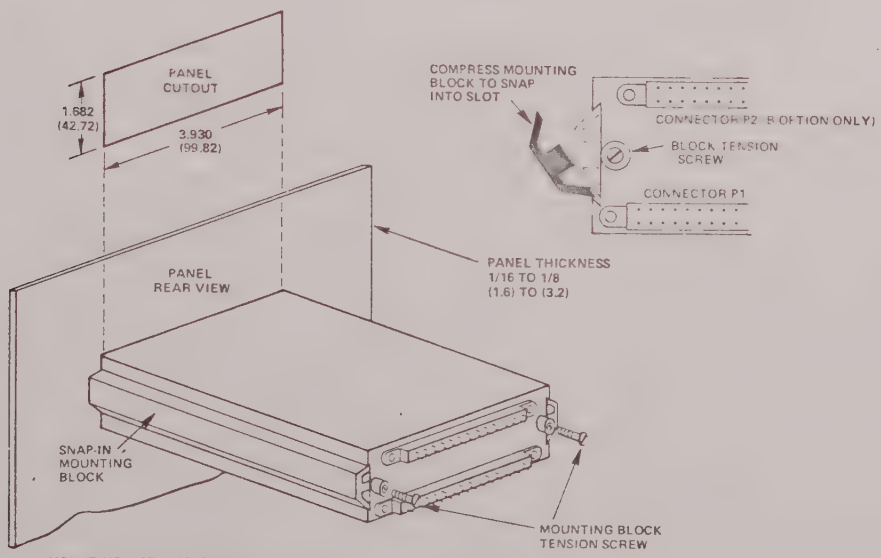


Figure 4. AD2024 Mechanical Outline (Dimensions shown in inches and (mm))



MOUNTING INSTRUCTIONS:
1. SLIDE DPM THROUGH PANEL CUTOUT FROM FRONT OF PANEL.
2. SNAP MOUNTING BLOCK INTO SLOT ON DPM SIDES.
3. TIGHTEN MOUNTING BLOCK TENSION SCREWS SNUGLY TO SECURE DPM TO PANEL (DO NOT OVERTIGHTEN!)
4. SNAP LENS ONTO FRONT OF DPM.

Figure 5. AD2024 Mounting Instructions (Dimensions shown in inches and (mm))

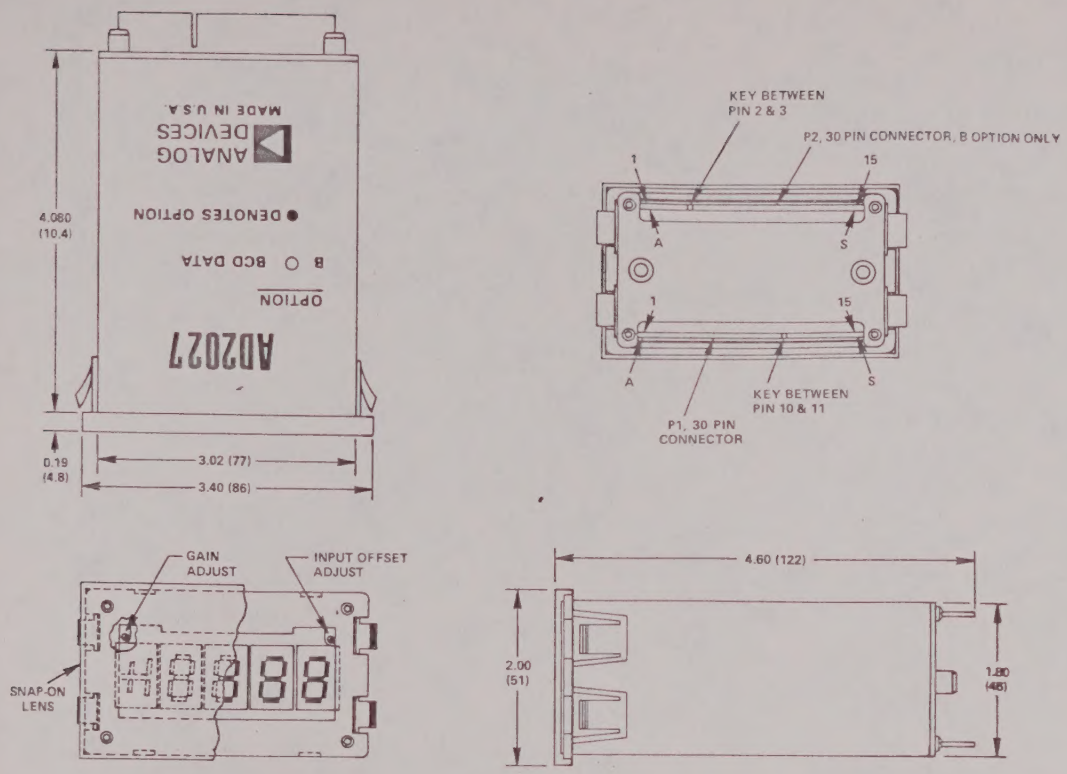


Figure 6. AD2027 Mechanical Outline, (Dimensions shown in inches and (mm))

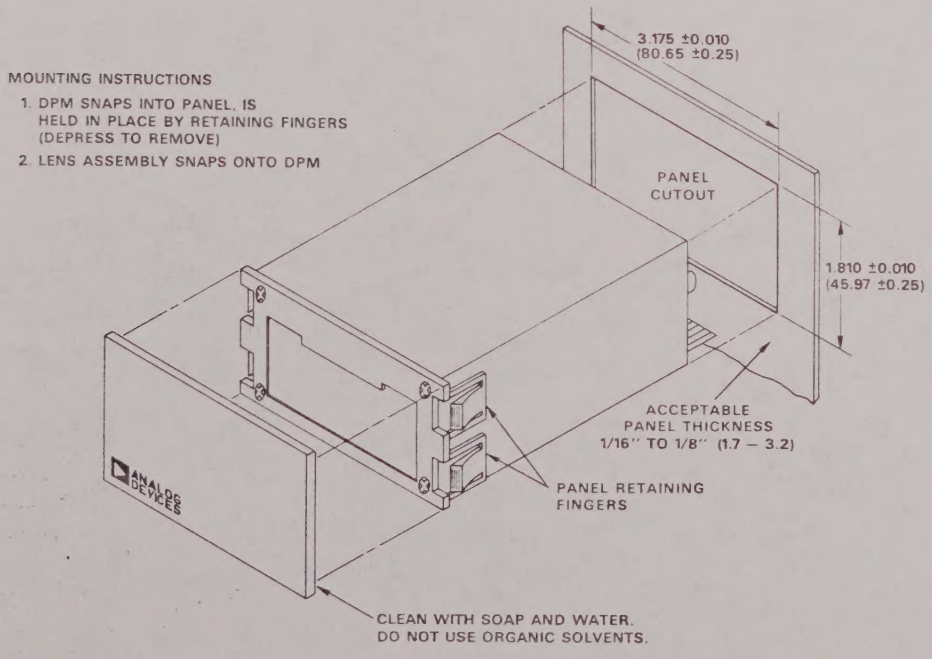

MOUNTING INSTRUCTIONS
1. DPM SNAPS INTO PANEL, IS HELD IN PLACE BY RETAINING FINGERS (DEPRESS TO REMOVE)
2. LENS ASSEMBLY SNAPS ONTO DPM
3.175 ±0.010 (80.65 ±0.25)
PANEL CUTOUT
1.810 ±0.010 (45.97 ±0.25)
ACCEPTABLE PANEL THICKNESS 1/16" TO 1/8" (1.7 – 3.2)
PANEL RETAINING FINGERS
CLEAN WITH SOAP AND WATER. DO NOT USE ORGANIC SOLVENTS.

Figure 7. Installation into Panel (Dimensions shown in inches and (mm))

C362–10–10/75
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